



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,479	02/21/2002	Min-Hsiung Chiang	67,200-576	1486

7590 01/15/2004
TUNG & ASSOCIATES
Suite 120
838 W. Long Lake Road
Bloomfield Hills, MI 48302

EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT	PAPER NUMBER
----------	--------------

1756

DATE MAILED: 01/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/081,479

Applicant(s)

CHIANG ET AL.

Examiner

Daborah Chacko-Davis

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 16-23, 33 and 34 is/are rejected.
- 7) ☒ Claim(s) 7-15 and 24-32 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims are rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent No. 6,656,785 (Chiang et al).

Chiang, in col 2, lines 34-37, in col 3, lines 1-36, in col 4, lines 59-67, in col 6, lines 9-15, discloses a process for forming a low-temperature MIM capacitor that integrates a copper layer as the metal layer, said process comprising an MIM capacitor on a substrate, depositing a copper layer on the substrate to form the metal layer of the MIM capacitor, wherein the MIM capacitor is used for logic-based embedded DRAM devices (claims 1-2, and 18-19). Chiang, in col 6, lines 29-30, and in col 7, lines 38-40, discloses that a photoresist layer (DRAM crown) is deposited on the layers of the substrate so as to enable DRAM crown lithography (claims 3, and 20). Chiang, in col 5, lines 1-13, in col 6, lines 1-8, discloses that the MIM capacitor formation process includes a) forming transistors during an FEOL process, b) forming an interlayer dielectric layer, c) forming an HAR contact on the substrate, and d) forming a W-plug on

Art Unit: 1756

said substrate (claims 4, and 21). Chiang, in col 6, lines 1-18, in col 7, lines 1-49, in col 11, lines 1-14, discloses depositing a metal-1oxide layer, performing photo and etch operations on the deposited layers of the substrate, depositing copper and/or Ta layer, and performing a CMP process on the substrate (claims 5, and 22). Chiang, in col 9, lines 1-39, discloses the deposition of a metal-2 oxide layer, followed by a VIA-1 photo and etch process (DRAM photo and etch) (claims 6, and 23).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 16-17, and 33-34, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 6,656,785 (Chiang et al) in view of U. S. Patent No. 6,271,084 (Tu et al).

Chiang is discussed in paragraph no. 2.

The difference between the claims and Chiang is that Chiang does not disclose forming the MIM capacitor utilizing at least one black diamond layer, wherein the diamond layer possesses a low K value permitting an associated AC delay to be reduced with increasing associated speeds thereof (claims 16, and 33). Chiang does not disclose forming the black diamond layer above a SiC layer and forming a SiON layer above the diamond layer (claims 17, and 34).

Tu, in col 2, lines 40-46, in col 3, lines 14-27, discloses that a first insulator stop layer is formed followed by the deposition of a low K dielectric layer such as black diamond layer and then a second insulator stop layer is deposited on the diamond layer, wherein the first and second insulator stop layers comprise SiON or SiC layers.

Therefore, it would be obvious to a skilled artisan to modify Chiang by employing the method of depositing low k dielectric layers to form MIM capacitors as taught by Tu because Tu, in col 1, lines 52-67, and in col 2, lines 1-14, and in col 4, lines 53-67, discloses that the low K dielectric layer is used for forming the dual damascene opening and the dual damascene process enables a reduction in the topology created by DRAM capacitor structures.

Allowable Subject Matter

5. Claims 7-15, and 24-32, are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 7-15, and 24-32, are allowable over the prior art of record (U. S. Patent No. 6,656,785 (Chiang et al) in view of U. S. Patent No. 6,271,084 (Tu et al)) because the prior art of record fails to disclose the formation of an MIM capacitor used in an embedded DRAM device wherein the substrate and the layers of the capacitor further include a metal-1 oxide layer, a metal-2 oxide-1 layer, and a copper layer and said substrate and layers thereof are subjected to a TaN sputter deposition process followed by a photoresist coating and etch operation to form at least one recess in a DRAM cell node.

Conclusion

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2693.

dcd
NO

January 5, 2004.


MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700